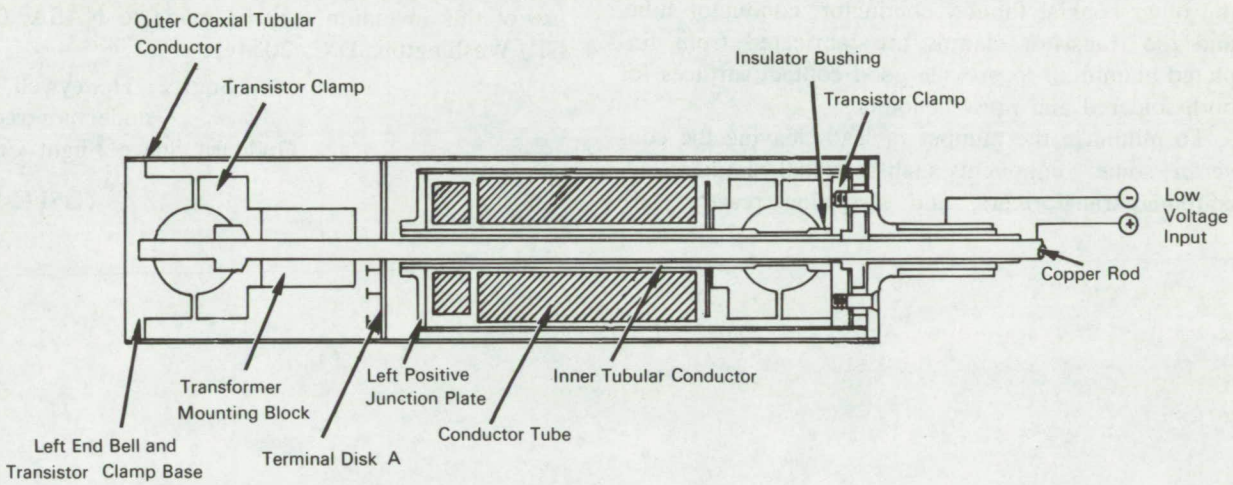
NASA TECH BRIEF

Low-Input Voltage Converter/Regulator Minimizes External Disturbances



The problem:

To develop a lightweight, low-voltage dc to high-voltage dc converter with minimum external magnetic field disturbance. The device is to be used to convert the output of fuel and solar cells, thermionic diodes, thermoelectric generators, and high-performance single-cell electrochemical batteries to a 28 vdc output.

The solution:

An efficient, low-input voltage converter/regulator constructed in a coaxial configuration. The coaxial design minimizes external magnetic field disturbance, suppresses radio noise interference, and provides excellent heat transfer from power transistors.

How it's done:

The coaxial-design converter mounts transistors at each end for optimum heat transfer to the converter's cylindrical outer surface.

The rod type conductor and the inner tubular conductor are fabricated from copper to provide maximum conductivity, which minimizes the conductor cross-sectional area required for efficient conversion of low-voltage, high-current power. The heavy primary currents travel a completely coaxial path in that they pass once through the center of the transformer cores and then return on the outer surface of the transformer by means of concentric coaxial tubular conductors. This arrangement produces zero external magnetic disturbance because the equal and opposite concentric current flow tends to cancel the magnetic fields generated by current flow in each respective direction.

The various transformer secondary windings are twisted pairs as they leave the transformer. These leads terminate at terminal disk A. The terminals on disk A are positioned so that the terminating points

(continued overleaf)

for the respective leads carrying equal and opposite currents are placed close together. This proximity minimizes the effective current loop that is capable of generating noncancelling magnetic fields. The lead wires that are brought out of the converter are also connected to these terminals. These leads are either coaxial or triaxial conductors, depending on the magnetic field cancellation requirements of the respective current paths. Hence, the twisted pairs, terminal spacing, and coaxial output leads minimize the magnetic disturbance that may be generated by the current flowing between the transformer, voltage regulator, and output circuitry. These leads exit at the left endbell and are connected to the voltage regulator assembly.

The remaining electrical conductive paths such as the outer coaxial tubular conductor, conductor tube, and the transistor clamps are fabricated from tin-plated aluminum to provide good contact surfaces for both soldered and press fit joints.

To minimize the number of leads leaving the converter, some components such as signal rectifiers, decoupling transformers, and switching reactors are internally mounted on the terminal disk and the transformer mounting block. This reduces the number of lead wires leaving the converter and lessens the complexity of lead routing.

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland 20771
Reference: B66-10689

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Honeywell, Inc.
under contract to
Goddard Space Flight Center

(GSFC-527)